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ABSTRACT

The generalization of acquired competencies, specifically flexibility of closure, was the subject of this research. Flexibility of closure was defined as the ability to demonstrate selective attention to a specified set of elements when presented within various settings (the larger the number of settings from which the desired set of elements can be selected, the higher the level of flexibility of closure). This study sought, specifically, to determine whether or not there is a significant relationship between flexibility of closure and the ability to generalize. The subjects were a randomly selected group of 64 first, second, third, and fourth graders. Flexibility of closure was measured by "The Children's Embedded Figures Test." Ability to generalize was measured by the "Science Process Instrument." The science topics covered were contained in the elementary science program "Science--A Process Approach." Analysis of data revealed a significant correlation between the generalization scores and the scores on the flexibility of closure measure for the total group. When the data was broken down by grade level and sex, however, the findings were not significant for girls or the first and second grade. (MH)

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A Study of One Learner Cognitive Style and the Ability to Generalize Behavioral Competencies

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A continuing interest among educators has been the generalization of acquired competencies (Cox, 1933; Thorndike, 1901; Judd, 1908; Gibson, 1942; Gagné, 1950; Dienes, 1961.). Innately it would seem that generalization is an obvious phenomena worthy of little interest. If one means by 'learn', following a sequence of procedural steps for each of which instruction is received, then obviously individuals do not learn every specific behavior they demonstrate. Abilities which have been acquired must be generalized. It is not the existence of this phenomenon which needs to be established but rather the conditions under which the generalization of behavior occurs and actually what is generalized. It is to the first part of this problem that the present investigation was addressed. A situation was identified in which generalization was observed and in which individual differences were apparent. An hypothesis was then stated to explain some of the observed differences.

It is platitudinal to comment that not all people think in the same manner - at least the steps employed by individuals in order to solve a problem are not all the same. It seems reasonable to consider the notion that the manner in which a person thinks, or his cognitive style, might influence the extent to which the individual generalizes competencies which he has already acquired. Attempts have been made by several investigators to identify and describe cognitive styles. Hanfman (1941) has discussed perceptual as opposed to conceptual problem solvers. Bruner (1956) has described those who use 'wholist' procedures as opposed to 'partist' procedures when solving a problem. Individuals who are compulsive and those who are reflective have been studied by Kagan (1965). 'Levellers' and 'sharpeners' have been described by Gardner (1959).

The investigation being reported in this paper focused on the cognitive style termed flexibility of closure (Thurstone, 1944; French, 1954; Witkin, 1954; Dienes, 1961.). The term 'flexibility of closure' was defined in this study as the ability to demonstrate selective attention to a specified set of elements when presented within various settings - the larger the number of settings from which the desired set of elements could be selected the higher the level of flexibility of closure. This cognitive style was selected for the investigation since generalization of acquired behaviors was being considered as stimulus generalization. S_1 is first demonstrated to elicit R_1 and then S_2 is demonstrated to elicit R_1. It seems feasible that the same elements must be identified in both stimulus situations, S_1 and S_2, which will lead to the equivalent response, R_1. If this is true, then flexibility of closure would appear to be a necessary component of generalization.

The research hypothesis was then made that, "The higher the student's score on a flexibility of closure measure, the greater the student's ability to generalize competencies gained in one content setting to

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another." The statistical hypotheses being tested therefore were:

$$H_o : \rho = 0$$
$$H_1 : \rho \neq 0$$

The measure used to assess the level of flexibility of closure was The Children's Embedded Figures Test, a modification made by Karp (1963) of The Hidden Figures Test. This test yielded scores ranging from 0 to 25. The ability to generalize behavioral competencies was determined by the use of the Science Process Instrument (AAAS, 1967) and a measure using the content setting of the social studies which was developed by the investigator. The latter measure was based on the model provided in the Science Process Instrument. A task was thus provided in science and in social studies for each of the behaviors being assessed (Table One). The stimulus for each of the tasks was considered as being composed of two parts; the setting and the cue. The cue, the question form, remained constant for each of the tasks. The science topics were all contained in the elementary science program, Science - A Process Approach. If a topic were included in any of the elementary school social studies textbooks or curriculum materials, then it was considered an appropriate topic for the content setting of social studies. The measure of ability to generalize behavioral competence was determined by the difference in level of competence in science and the level of competence in social studies each of which was assessed on a ten point scale. The generalization scores therefore ranged from -10 to +10.

The population in this investigation was all of the students in the first, second, third and fourth grades of the Oshkosh, Wisconsin Public Schools System. This school system used the elementary school science materials published under the title, Science - A Process Approach (AAAS-Xerox, 1967). The sample space was the set of sixty-four first, second, third and fourth grade students randomly selected from the defined population. The investigator administered the Science Process Instrument, the social studies items, and the Children's Embedded Figures Test individually to each of the sixty-four children. A balancing procedure was employed to compensate for any practice effects which might have been experienced by the students.

A Pearson's product-moment correlation coefficient was computed to test the statistical null hypothesis: $\rho = 0$. A t-test was employed to determine the level of significance of the correlation computed. The information relevant to this analysis is presented in Table Two. It can be observed that a correlation coefficient of .44 was obtained between the generalization scores and the scores on the flexibility of closure measure for the total group. This is significant beyond the 0.05 level which was the level desired for significance in the experimental design. The null hypothesis was rejected; there is a relationship between the ability to generalize and ability in flexibility of closure as measured in this investigation and at the age level involved in this investigation. When the data, however, were analyzed with respect to grade level and to sex some differences

Table One — Items in content settings of science and social studies for one of the set of behavioral objectives.

Level 4 - B — Demonstrating the use of a chart to record information.

Science

Materials
1. One card with an illustration of a stormy day.
2. One blank weather chart.

Question — (Give child blank weather chart. Point to the classification part of the chart and say:) This chart shows symbols which can be used for recording the weather. This one is for the temperature (point to the column below the title, Temperature), this one is for the wind (point to the appropriate column), and this one is for other forms of weather (point to the last column).

Pretend this picture shows a scene you could see on Monday. Complete the chart for Monday by using the symbols which best describe the weather. (Point to the day, Monday, on the chart.)

Response — Makes the following recordings: temperature, wind, clouds, and other.

Social Studies

Materials
1. One card with illustration of an Indian Village.
2. Blank record sheet for transportation, housing and occupations.

Question — (Give child blank town chart. Point to the classification part of the chart and say:) This chart shows symbols which can be used for recording information about towns. These are for occupations (point to symbols representing occupations), these are for transportation (point to symbols for transportation), and these are for housing (point to appropriate symbols). This picture shows you a scene in an Eastern Woods Indian village. Complete the chart by using the symbols which describe the village.

Response — Makes the recordings for the three characteristics.

Table Two - Correlation coefficient and tests of significance for statistical hypothesis.

$H_o : \rho = 0$

Grade	N	r	df	t	Level of significance	Decision
1	16	.21	14	1.0508	NS	Retain
2	16	.40	14	1.6332	0.10	Retain
3	16	.64	14	3.1165	0.005	Reject
4	16	.53	14	2.3385	0.10	Reject
Boys	32	.56	30	3.7022	0.0005	Reject
Girls	32	.29	30	1.6588	0.10	Retain
Total	64	.44	62	3.8581	0.0005	Reject

were revealed. The findings were not significant beyond the 0.05 level at the first grade or the second grade levels or among the girls.

Flexibility of closure (field articulation) has been domonstrated by Witkin (1954) to be a variable which interacts with age. He suggested that a stability is observed when the child reaches the age of about ten years. This may account for the significant findings which were obtained at the third and fourth grade levels as opposed to the non-significant findings which were obtained for Grades One and Two. Dienes (1961) has also suggested that cognitive style is not as reliable a predictor of ability for girls as it is for boys. This suggestion is consistent with the findings from this investigation.

As a result of the non-significance of findings in the early grades and the significance of the findings in the third and fourth grades it would be useful to replicate this study with older children when the cognitive style of flexibility of closure apparently has greater stability. If further support is found for the research hypothesis it would be useful to develop curriculum materials for those students who do demonstrate high ability in flexibility of closure. In these materials the ability to generalize would be assumed and each specified behavior would be introduced in only one content setting. This would facilitate the use of the most appropriate and interesting learning stiuations and would be more efficient than repeated introduction of the same behavior. For those students who demonstrate less ability in flexibility of closure the materials would be more specific and there would be definite instruction for generalization of behaviors. Of course a second and more intriguing tactic would be to develop training protocols in an attempt to influence cognitive style.

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Bibliography

AAAS, Commission on Science Education, Science Process Instrument, Observing Process. Washington, D. C.: American Association for the Advancement of Science, 1967.

Bruner, Jerome S., J. J. Goodnow and G. A. Auston. A Study of Thinking. New York: John Wiley & Sons, Inc., 1956.

Cox, J. W. "Some Experiments on Formal Training in The Acquisition of Skills." British Journal of Psychology, 24: 67-87, 1933.

Dienes, Zolton P. "On Abstraction and Generalization." Harvard Educational Review, 31: 281-301, 1961.

French, J. W. ed. Manual for Kit of Selected Tests for Reference Aptitude and Achievement Factors. Princeton: Educational Testing Service, 1954.

Gagné, Robert M., K. A. Baker and H. Foster. "On the Relations Between Similarity and Transfer of Training in Learning and Discriminative Motor Tasks." Psychological Review, 57:67-79, 1950.

Gardner, Riley, W., et al, "Cognitive Control: A Study of Individual Inconsistencies in Cognitive Behavior." Psychological Issue, No. 4, Monograph 4, 1959.

Gibson, Eleanor J. "Intra-List Generalization as a Factor in Verbal Learning." Journal Experimental Psychology, 30: 185-200, 1942.

Hanfman, Eugenia. "A Study of Personal Patterns in an Intellectual Performance." Character and Personality, 9: 315-325, 1941.

Judd, C. H. "The Relation of Special Training and General Intelligence." Educational Review, 36: 42-48, 1908.

Kagan, Jerome et al. "Information Processing in the Child." Psychological Monographs, 78: Whole No. 578, 1965.

Karp, Stephen A. and Norma L. Lonstadt. Children's Embedded Figures Test. New York: Cognitive Tests, 1963.

Thorndike, E. L. and R. S. Woodworth. "The Influence of Improvement in one Mental Functioning upon the Efficiency of Other Functions." The Psychological Review, 8: 247-261 (a); 384-395 (b), 1901.

Thurstone, L. L. "A Factorial Study of Perception." Psychometric Monographs No. 4, 1944.

Witkin, H. A. et al. Personality Through Perception. New York: Harper and Row, 1954.